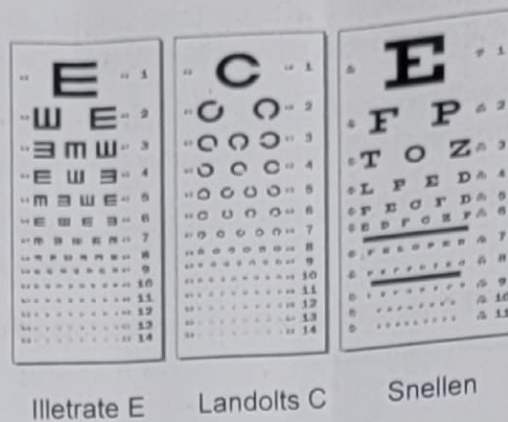


1-Visual acuity (VA) is a measure of the ability of the eye to distinguish shapes and the details of objects at a given distance

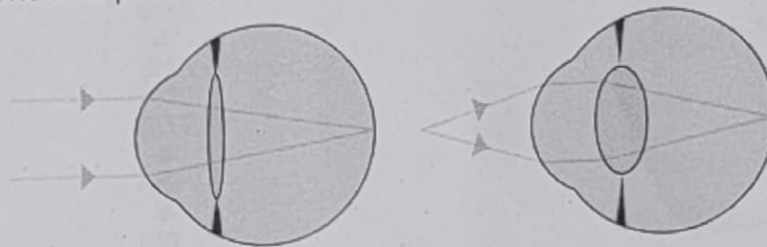


Why is visual acuity done at 6 meters?

- At this distance, the rays are almost parallel, and the patient usually does not accommodate to see at this distance

What is the meaning of "Accommodation"?

- It is the mechanism by which the eye changes refractive power by altering the shape of its crystalline lens.
- The ciliary muscle contracts  $\Rightarrow$  The zonular fibers relax  $\Rightarrow$  The lens becomes more MORE CONVEX  $\Rightarrow$  The lens power increases



How to measure VA?

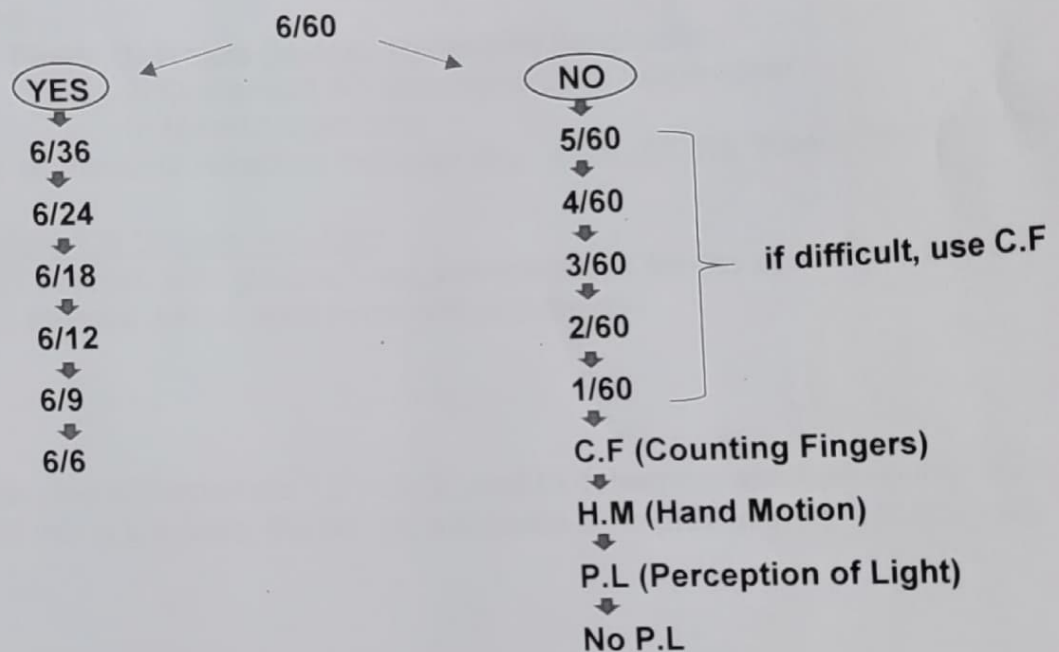
- Ask the patient to cover one eye with a plain occluder, card or tissue. They should not press on the eye; this is not good for an eye that has undergone surgery. It can also make any subsequent intraocular pressure reading inaccurate and it will distort vision when the occluded eye is tested.
- Ask the patient to read from the top of the chart and from left to right. If the patient cannot read the letters due to language difficulties, use an E chart. The patient is asked to point in the direction the 'legs' of the E are facing.



- Record the VA for each eye in the patient's notes, stating whether it is with or without correction (spectacles). For example: **Right VA = 6/18 with correction, Left VA = 6/24 with correction.**
- If the patient cannot read the largest (top) letter at 6 meters, move him/her closer, 1 meter at a time, until the top letter can be seen – the VA will then be recorded as 5/60 or 4/60, etc.
- If the top letter cannot be read at 1 meter (1/60), hold up your fingers at varying distances of less than 1 meter and check whether the patient can count them. This is recorded as counting fingers (CF): **VA = CF**
- If the patient cannot count fingers, wave your hand and check if he/she can see this. This is recorded as hand movements (HM): **VA = HM**
- If the patient cannot see hand movements, shine a torch toward the eye and ask if they can see the light. If they can, record 'perception of light' (**VA = PL**). If they cannot, record 'no perception of light' (**VA = NPL**).

The **top number** refers to the **distance where the patient stands from the chart**. In most cases, this will be 6 meters. **The bottom number refers to the distance at which an average person with normal eyesight could read the same line that the patient reads.**

For example, 6/6 is considered normal. 6/12 indicates that the line which the patient reads correctly could be read by a person with normal vision from 12 meters away.



| Metric | Imperial<br>(American) feet | Decimal |
|--------|-----------------------------|---------|
| 6/60   | 20/200                      | 0.1     |
| 6/30   | 20/100                      | 0.2     |
| 6/24   | 20/80                       | 0.25    |
| 6/18   | 20/60                       | 0.3     |
| 6/15   | 20/50                       | 0.4     |
| 6/12   | 20/40                       | 0.5     |
| 6/9    | 20/30                       | 0.6     |
| 6/7.5  | 20/25                       | 0.8     |
| 6/6    | 20/20                       | 1.0     |

N.B: 1 meter = 3.3 feet (so 6 meters  $\times$  3.3 = 20 Feet)

## Refraction

- It is done using 1 -Autorefractometer  
Or 2- Retinoscope (usually used for young children)

N.B: In Children, cycloplegic refraction (refraction after using cycloplegic drops e.g. Tropicamide, Cyclopentolate, Atropine) is usually needed to get the correct refraction because children have strong accommodative power.

- The result could be any of the following:
  - 1- Emmetropia (NO refractive errors)
  - 2- Myopia
  - 3- Hypermetropia
  - 4- Astigmatism: Types
    - 1- Simple (Myopic, Hyperopic) Astigmatism
    - 2- Compound (Myopic, Hyperopic) Astigmatism
    - 3- Mixed Astigmatism
- Anisometropia: means asymmetric refraction between both eyes (MORE than 1 DIOPTER in spherical equivalent)
- Note: Spherical equivalent =  $\frac{1}{2}$  Cylinder + Sphere
- If the patient does NOT improve with glasses, then you must look for the cause!!(e.g., cornea, anterior chamber, lens, vitreous, retina, optic nerve, visual pathway)

## 2-Pinhole test

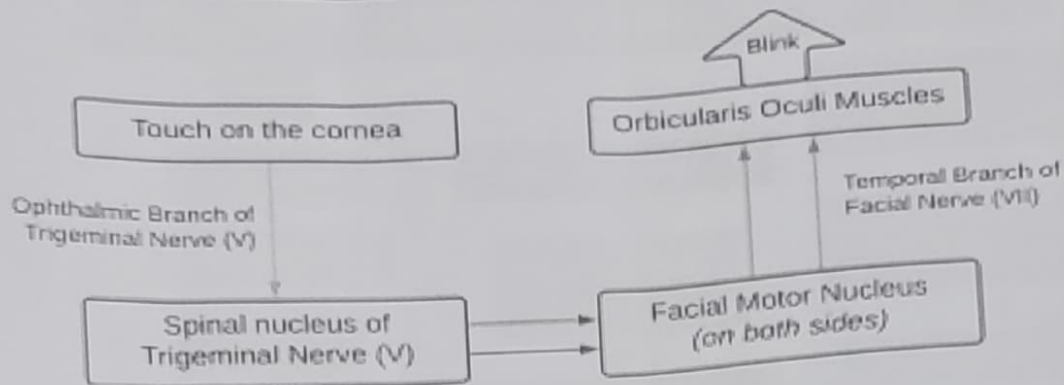
A pinhole occluder ( an opaque disc with one hole 1.2 mm) is used to determine whether reduced vision is caused by refractive error. If this is the case, the pinhole will cause an improvement in visual acuity.

## 3- Color vision test

- Ishihara test** is most commonly used
- Types of color blindness
  1. **Protanopia** : inability to see RED color
  2. **Deutanopia**: inability to see GREEN color
  3. **Tritanopia**: inability to see BLUE color
  4. **Achromatopsia**: inability to see ALL colors

## Ocular reflexes

### 1- Corneal reflex (Blink reflex +/- tear reflex)



**Afferent** Ophthalmic Branch of Trigeminal Nerve (SENSORY)

**Efferent** Facial Nerve (MOTOR) + parasympathetic stimulation of lacrimal gland

**Q: What increases corneal reflex?**

A: Corneal or conjunctival irritation (Dryness, F.B, Infection,..etc)

**Q: What decreases corneal reflex?**

#### 1- Disorders affecting Trigeminal Nerve

- Topical anesthesia, Recurrent Herpetic Keratitis, Chemical injuries
- Cerebellopontine angle tumors, Multiple Sclerosis, Brain stem stroke, etc...

**Neurotrophic Corneal Ulcer**

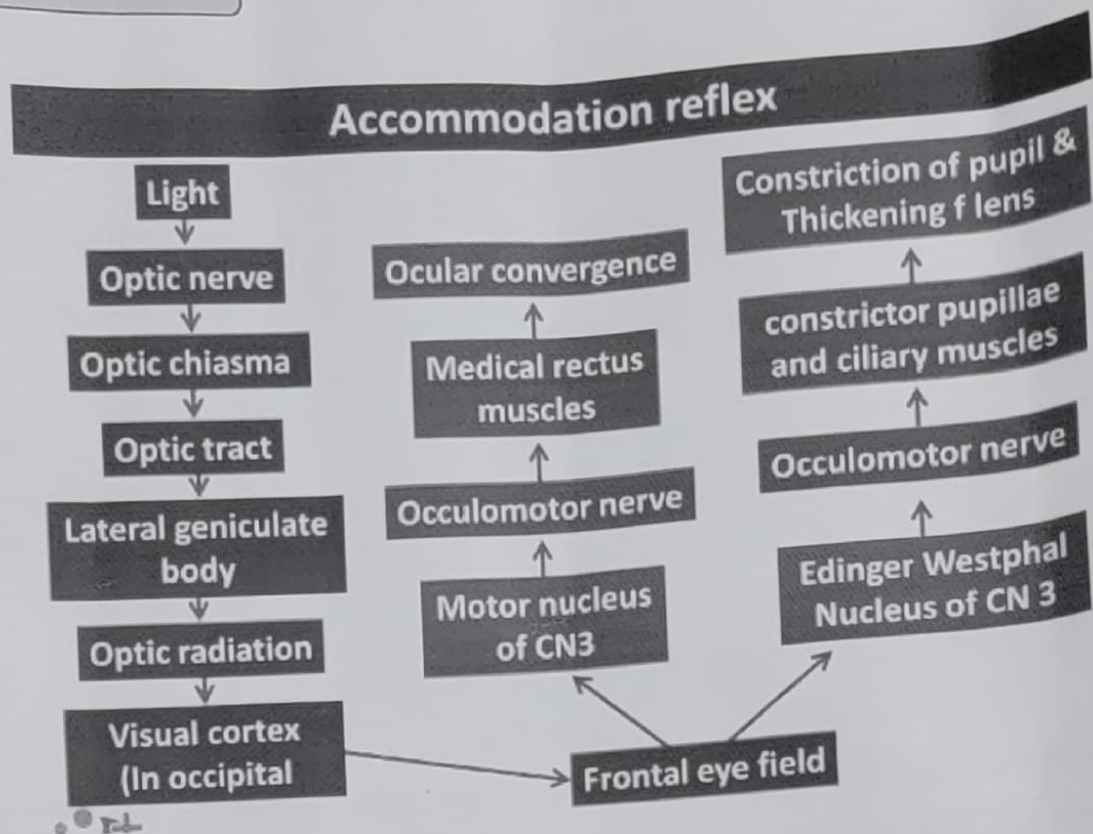
#### 2- Disorders affecting Facial Nerve (e. g. Bells palsy)

**Exposure Keratitis**

Treatment:

- Topical Antibiotic drops (until ulcer heals) e.g. Tobramycine eye drops 1\*4
- Topical Lubricant drops (until reflex works again)
- Topical Antibiotic ointment at bed time e.g. Erythromycine eye ointment (with emphasis to close eyelids with medical adhesive plaster at bed time in case of Exposure Keratitis)

## 2- Accommodation (Near) reflex



### • Components

- 1- Convergence
- 2- Pupil constriction (miosis)
- 3- Accommodation : Increased lens thickening (increased lens power)

### • Disorders causing disturbance of accommodation

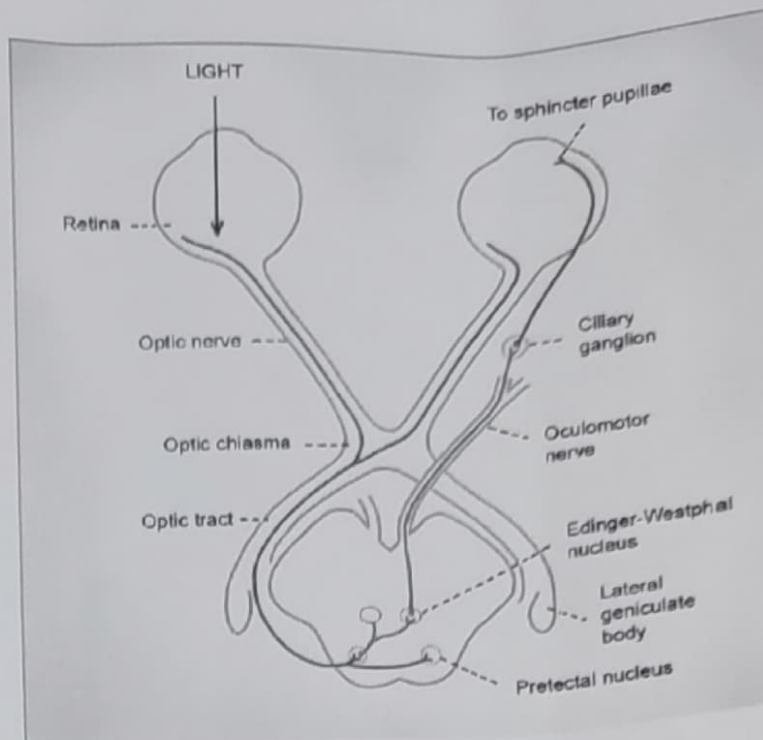
1. presbyopia  $\Rightarrow$  the crystalline lens becomes less elastic and therefore it cannot increase its power in response to near objects
2. Cycloplegic mediatric drops  $\Rightarrow$  distrubace of miosis and accommodation
3. Midbrain lesions  $\Rightarrow$  disturbance of convergence
4. Adie's pupil  $\Rightarrow$  disturbance of miosis and accommodation

### 3- Light reflex

- **Pathway**

Afferent → optic nerve

Efferent → Parasympathetic with the 3rd nerve



- **Types :**

1- *Direct light reflex* : constriction of the pupil of the same eye that you're shining the light at.

2- *Indirect light reflex (Consensual light reflex)*: constriction of the pupil of the right eye, for example while you're shining the light at the left eye.

- **Method**

**Direct light reflex:** *In a dim lighted room*, ask the patient to look forwards far away and then shine the light towards the left eye from the side (in order not to stimulate the accommodation reflex). Look at left eye's pupil (normally it should constrict).

**Indirect light reflex:** Repeat the above step, but this time look at the right eye's pupil while you shine the light at the left eye. The right eye's pupil normally should constrict as well.

- **Lesions**

1- If the optic nerve is damaged:

- ✓ **Amourotic pupil** (when the affected eye is stimulated by light, neither pupil will react), but when the normal other pupil is stimulated by light, both pupils react normally)
- ✓ **Argyll-Robertson pupil** (caused by neurosyphilis): damage to pretectal nucleus
- ✓ Both pupils are equal in size
- ✓ The near reflex is NORMAL

2- If the Parasympathetic nerve is damaged:

- ✓ In the affected side, the pupil is dilated and does not react to direct or indirect light reflex.
- ✓ The accommodation reflex is poor as well.